14. Cervulus muntjac, Zimm.
a. ♀. 4000 feet. 10/91.

The following is a list (inserted for comparison) of the mammals obtained during the past few years by Messrs. Hose and Everett at Baram, N.E. Sarawak, that district forming the lowland country between Mt. Dulit and the sea :—

Hylobates leuciscus, *Schr.*
—— mülleri, *Mart.*
Semnopithecus cristatus, *Raff.*
—— chrysomelas, *Müll. & Schl.*
—— hosei, *Thos.*
—— rubicundus, *Müll. & Schl.*

Felis bengalensis, *Kerr* (F. minuta, *Temm.*).
—— planiceps, *Vig. & Horsf.*
—— badia, *Gray.*
Hemigale hardwickei, *Gray.*
Herpestes brachyurus, *Waterh.*
—— semitorquatus, *Gray.*

Tupaia ferruginea, *Raff.*
—— picta, *Thos.*
—— dorsalis, *Schl.*

Cynopterus spadiceus, *Thos.*
Rhinolophus luctus, *Temm.*
Hipposiderus cervinus, *Gould.*

Sciuropterus pulverulentus, *Günth.*
—— horsfieldi, *Waterh.*[1]
—— lepidus, *Horsf.*
Rheithrosciurus macrotis, *Gray.*
Sciurus prevostii, *Desm.*
—— tenuis, *Horsf.*
—— lowii, *Thos.*[2]
Mus, sp. inc. (allied to *M. coxingi*, Swinh.).
Trichys guentheri, *Thos.*

Sus barbatus, *Müll. & Schl.*
Tragulus napu, *F. Cuv.*
Cervulus muntjac, *Zimm.*

EXPLANATION OF THE PLATES.

Plate XVIII.

Hemigale hosei.

Plate XIX.

Figs. 1–3. Skull of *Hemigale hosei.*
4, 5. Skull of *Tupaia melanura.*
6. Skull of *Sciurus brookei.*

3. Descriptions of some new Species of Timeliine Birds from West Africa. By R. Bowdler Sharpe, LL.D., F.L.S., &c.

[Received February 27, 1892.]

(Plate XX.)

My old friend Prof. Barboza du Bocage has recently sent me for comparison a very interesting bird, which he has received from his correspondent Senhor Francisco Newton, who is well known to Ornithologists as the discoverer of several new and remarkable forms of

[1] I much regret to have to state that the *Sciuropterus* described by me (P. Z. S. 1886, p. 74) as *S. davisoni* proves on re-examination, with larger series, to be referable to *S. horsfieldi*, whether that in its turn is or is not the same as *S. sagitta*, Linn.

[2] Ann. Mag. N. H. (6) ix. p. 253 (1892).

birds in the island of St. Thomas. This new species has a brown style of coloration which is characteristic of many Timeliine birds, but it seems to find its nearest ally in a Malayan genus *Crateroscelis* of Malacca and Borneo. It differs, however, from that genus in certain evident characters, which may be diagnosed as follows:—

AMAUROCICHLA, gen. nov.

Similar to *Crateroscelis*, but distinguished by the shape of the wing, the first primary being nearly as long as the second. Additional characters are:—The bill is as long as the head, and rictal bristles are absent, while the tail-feathers are somewhat acuminate. The type is:—

AMAUROCICHLA BOCAGII, sp. nov. (Plate XX. fig. 1.)

Adult. General colour above uniform chocolate-brown, the wings and tail a little darker than the back; lores and sides of face dark brown like back, the ear-coverts slightly rufescent, like the sides of the neck; cheeks and throat whitish, with a slightly indicated malar line of rufous; lower throat and rest of under surface of the body rufous; the abdomen isabelline; under wing-coverts isabelline; quills sepia-brown below. Total length 5 inches, culmen 0·8, wing 2·55, tail 1·55, tarsus 0·95.

Hab. San Miguel, west coast of St. Thomas, West Africa.

While describing this interesting species I may add the diagnosis of another Timeliine bird recently acquired by the British Museum, which also seems to be undescribed, and for which I propose the following name:—

TURDINUS MOLONEYANUS, sp. nov. (Plate XX. fig. 2.)

Adult. General colour rufous brown, inclining to chestnut on the lower back, rump, and upper tail-coverts, as well as on the wings; primaries dusky, externally light rufous; tail-feathers light rufous brown, externally shaded with chestnut; crown of head slightly more dusky than the back; an indistinct line of ashy grey above the eye, and the feathers below the latter ashy; ear-coverts brown; throat and under surface of body tawny rufous, more rufous on the fore neck, chest, and sides of body, the latter inclining somewhat to reddish brown; thighs like the abdomen; under tail-coverts light chestnut; axillaries and under wing-coverts tawny rufous; quills dusky below, rufescent along the inner web. Total length 6·6 inches, culmen 0·85, wing 2·7, tail 2·5, tarsus 1·0.

Hab. Gold Coast.

The typical specimen was presented to the British Museum by Sir Alfred Moloney, who procured it during the time that he was Governor of the Colony.

4. On the Classification of Birds.

By Hans Gadow, M.A., Ph.D., F.Z.S., Strickland Curator and Lecturer on Advanced Morphology of Vertebrata in the University of Cambridge.

[Received March 12, 1892.]

By undertaking, in 1884, the continuation of the part 'Aves' of Bronn's 'Klassen und Ordnungen des Thier-Reichs,' I became pledged not only to a descriptive account of the anatomical structure of birds, but also to a systematic treatment of this Class with its Orders.

The anatomical portion has been written with the view of abstracting therefrom a classification. In the meantime (after Huxley, Garrod, Forbes, Sclater, and Reichenow's systems) have appeared several other classifications: one each by Prof. Newton, Dr. Elliott Coues, Dr. Stejneger, Prof. Fuerbringer, Dr. R. B. Sharpe, and two or three by Mr. Seebohm. Some of these systems or classifications give no reasoning, and seem to be based upon either experience in ornithological matters or upon inclination—in other words, upon personal convictions. Fuerbringer's volumes of ponderous size have ushered in a new epoch of scientific ornithology. No praise can be high enough for this work, and no blame can be greater than that it is too long and far too cautiously expressed. For instance, the introduction of "intermediate" groups (be they suborders or gentes) cannot be accepted in a system which, if it is to be a working one, must appear in a fixed form. In several important points I do not agree with my friend; moreover, I was naturally anxious to see what my own resources would enable me to find out. This is my apology for the new classification which I propose in the following pages.

The author of a new classification ought to state the reasons which have led him to the separation and grouping together of the birds known to him. This means not simply to enumerate the characters which he has employed, but also to say why and how he has used them. Of course there are characters and characters. Some are probably of little value, and others are equivalent to half a dozen of them. Some are sure to break down unexpectedly somewhere, others run through many families and even orders; but the former characters are not necessarily bad and the latter are not necessarily good. The objection has frequently been made that we have no criterion to determine the value of characters in any given group, and that therefore any classification based upon any number of characters however large (but always arbitrary, since composed of non-equivalent units) must necessarily be artificial and therefore be probably a failure. This is quite true if we take all these characters, treat them as all alike, and by a simple process of plus or minus, *i. e.* present or absent, large or small, 1, 2, 3, 4, &c., produce a "Key," but certainly not a natural classification.

To avoid this evil, we have to *sift* or *weigh* the same characters every time anew and in different ways, whenever we inquire into the

degree of affinity between two or more species, genera, families, or larger groups of creatures.

This I have tried to do in a manner hitherto not applied to birds; it may have been done by others, but they have not published any account of this process. Certainly it has not been applied throughout the whole Class of Birds.

I have selected about forty characters from various organic systems (see Appendix, p. 254), preferring such characters which either can be expressed by a formula or by some other short symbol, or which, during the working out of the anatomical portion of Bronn's 'Aves,' have revealed themselves as of taxonomic value, and of which I have learnt to understand the correlation, determining causes, and range of modification. Other characters, perhaps too complicated, too variable, or last, but not least, too imperfectly known in many birds, are left out or reserved for occasional employment.

Of my 40 characters about half occur also in Fuerbringer's table, which contains 51 characters. A number of skeletal characters I have adopted from Mr. Lydekker's 'Catalogue of Fossil Birds,' after having convinced myself, from a study of that excellent book, of their taxonomic value. Certain others referring to the formation of the rhamphotheca, the structure and distribution of the down in the young and in the adult, the syringeal muscles, the intestinal convolutions, and the nares, have not hitherto been employed in the Class of Birds.

Groups of birds, arranged in *bona fide* families, sometimes only genera of doubtful affinity, were compared with each other—each family with every other family or group—and the number of characters in which they agree was noted down in a tabular form. Presumably families which agree in all the 40 characters would be identical, but this has never happened. There are none which differ in less than about 6, and none which agree in less than 10 points. The latter may be due to their all being birds. It is not easy to imagine two birds which would differ in all the 40 characters.

In another table all the families were arranged in lines according to their numerical coincidences, and attempts were made to arrange and to combine these lines of supposed affinities in tree-like branches [1]. These attempts are often successful[2], often disappointing [3].

[1] Many calculations are obviously unnecessary: for instance, the comparison of Geese with Parrots or Passeres; Steganopodes with Swifts, Rollers, Trogons, &c.

[2] For instance, Pteroclidæ agree with Limicolæ and with Columbæ in about 29 points, with Alcæ and with Gallidæ in 24, with Ralli in 21, with Lari only in 18.—Again, Lari agree with Alcæ and with Limicolæ in 33 or 34; Limicolæ agree with Alcæ, Lari, and Ralli each in 33, with Pterocles and Columbæ in 30 or 31, with Gallidæ in 26. Combination of these lines shows that Lari and Pterocles are widely divergent from each other, while they each separately agree closely with the Limicolæ; in other words, Lari and Pterocles are specialized in two different directions as terminal divergent branches of one common Limicoline stock.

[3] The more generalized, or rather the less specialized, two given groups are, the more characters they will probably have in common, and similar false affinities will appear the more likely the greater the diversity of organic modifi-

Of course this merely mathematical principle is scientifically faulty, because the characters are decidedly not all equivalent. It may happen that a great numerical agreement between two families rests upon unimportant characters only, and a small number of coincidences may be due to fundamentally valuable structures, and in either case the true affinities would be obscured. This it was necessary to inquire into. But at any rate I obtained many hints from this simple mode of calculation, indicating the direction which further inquiry should take.

The *Psittaci* may serve as an example of my mode of sifting characters.

According to the numerical agreement of the 40 characters employed generally, we have the following table :—

Psittaci agree with Coccyges in 31 points, with Pici in about 29, with Coraciidæ 25, Falconidæ 25, Striges 22, Bucerotidæ 22, Gallidæ 21, against 19 points of difference.

A previous line of investigation had revealed the fact that the Coccyges and Gallidæ are intimately connected with each other through *Opisthocomus*. This knowledge obviated further inquiry as to the affinity between Psittaci and Gallidæ.

I. *Comparison of Psittaci with Falconidæ.*

Psittaci and Falconidæ agree.	*Psittaci and Falconidæ differ.*
Nidicolous = Cuculi.	Toes = Cuculi (not *Pandion*).
Woolly nestlings.	10 remiges = Cuculidæ.
Distribution of nestling downs.	No vomer = Musophagidæ.
Distribution of adult downs.	Mandible = Musoph.
Cervical apteria = Cuculi.	+Ectepicondylar process = Cuc.
Dorsal apteria = Coccyges.	+Tibial intercondylar tubercle=Cuc.
Ventral apteria = Musophagidæ.	Hypotarsus complex = Cuc.
Aftershaft = Musoph.	Flexor tendons = Cuc.
Tufted oil-gland = Musoph.	Garrod's formula = Cuc.
Aquinto-cubital.	Large procoracoid process = Cuc.
Desmognathous = Cuculi.	Thoracal hæmapophyses = Cuc.
No basipteryg. proc. = Cuculi.	Food = Musoph.
Holorhinal = Cuculi.	Cæca none = Musoph.
Nares impervіæ = Cuculi.	Syrinx specialized.
Shallow temporal fossa.	
Number of cervical vertebræ=Cuculi.	14 negative points.
No spina interna = Cuculi.	
Spina externa = Cuculi.	
Posterior sternal margin = Cuculi.	
Coracoids = Cuculi.	
Furcula = Cuculi.	
Humero-coracoid groove = Cuculi.	
Cervical hæmapophyses = Cuculi.	
2 carotids = Cuculi.	
Tongue.	
Intestinal convolutions.	
26 positive points.	

cations within the various members of such groups, as, *e. g.*, Tubinares and Accipitres, Limicolæ and Passeres. These are traps which it is not always easy to avoid.

Of the 26 positive points not less than 19 are common to Falconidæ, Psittaci, and Coccyges. In the remaining 7 points Psittaci and Falconidæ agree together against Coccyges, namely nestlings, downs of young and adult, fifth cubital, temporal fossa, fleshy tongue, convolutions of intestines. Most of these characters seem important, especially the woolly nestlings, considering that Psittaci breed in holes, and agree in the convolutions in spite of the totally different food.

On the other hand, the sifting of the 14 negative characters shows that in 13 of them the Parrots agree with Cuculidæ or with Musophagidæ, or with both, and differ along with the Coccyges from the Falconidæ. The syrinx is an absolute specialization. Fuerbringer remarks that powder-downs, ceroma, and beak speak for Falconidæ against Coccyges. Again, Psittaci and Falconidæ differ greatly in the formation of the furcula, in nearly the whole of the muscular system, and in the bones of the wings and legs.

Conclusion.—The Psittaci are much more nearly allied to the Coccyges than to the Falconidæ, and of the Coccyges the Musophagidæ are nearer than the Cuculidæ because of the vegetable food, ventral pterylosis, presence of aftershaft, tufted oil-gland, absence of vomer, truncated mandible, and absence of cæca.

II. *Comparison of Psittaci, Coraciidæ, and Coccyges,* based by Fuerbringer chiefly upon the pterylosis, anterior lateral process of the sternum, procoracoid process, clavicular connexion, hypotarsus, shortness of metatarsus, many muscles of the shoulder and thigh. He observes, however, that the greater number of characters is against this relationship. The comparison made by me is given in the Table now before us (see p. 233).

III. *Comparison of Psittaci and Striges.* 22 characters agree, 18 differ; the latter are:—

Toes. . . Striges more primitive, although ectamphibolic.
Downs of adult in Striges only upon apteria.
Ventral pterylæ.
10 primaries. Striges with 11, *i. e.* more primitive.
Aftershaft large.
Tufted oil-gland.
Desmognathous. Striges more primitive.
Vomer. Striges more primitive.
Basipterygoid processes. Striges more primitive.
Temporal fossa.
Coracoids overlapping in Striges.

Table.

Comparison of Psittaci, Coraciidæ, and Coccyges.

Psittaci = *Coraciidæ* = *Coccyges.*	*Psittaci* = *Coraciidæ* and differing from *Coccyges.*	*Psittaci* = *Coccyges* and differing from *Coraciidæ.*	*Psittaci* differing from *Coraciidæ* and *Coccyges.*
Nidicolous.	Dorsal-spinal apterium.	Toes.	Downy nestlings.
Cervical apteria.	Frequent absence of bony tibial bridge.	Ventral apteria.	Downs of adult.
Primaries.		Aftershaft large (Musoph.).	Aquinto-cubital.
Desmognathous.	2	Oil-gland (Musoph.).	Shallow temporal fossa.
No basypteryg. proc.		Vomer.	Tongue.
Holorhinal.		Ectepicondylar process.	Cæca.
Nares impervious.		Toe flexors.	Intestinal convolutions [1].
Mandible truncated.		Cæca absent (Musoph.).	7
14 cervical vertebræ. Cervical hæmapophyses. Thoracal hæmapophyses.		8	
Spina externa.			
Spina interna.			
Posterior sternal margin.			
Coracoids. Procoracoid process.			
Furcula.			
Humero-coracoidal groove.			
Tibial intercondylar tubercle.			
Hypotarsus.			
2 carotids.			
Food.			
22			

[1] The convolutions of the Psittaci are peculiar; the telogyrous tendency of the loops resembles that of Falconidæ, but this is also indicated in several Cuculidæ, while on the whole the convolutions of the Psittaci combine a mixture of Coraciine and Cuculine characters. *Cf.* Bronn, Aves, p. 708.

Intercondylar tubercle.
Hypotarsus. Striges raptorial type.
Thigh-muscles. Striges very specialized.
Syrinx. Striges more primitive, Cuculiform.
Intestinal convolutions.
Food. } Parrots specialized.
Cæca. }

These differences are important enough, not only on account of their number but also on account of their value, to remove Psittaci and Striges far from each other. Striges are perhaps on the whole more primitive, but both groups have been specialized in two different directions. Some of the agreements (*e. g.* absence of a bony tibial bridge, the sternal configuration) are most likely referable to the numerous organic links which connect the Coraciiformes and Cuculiformes with each other.

IV. *Comparison of Psittaci with Pici.* Curiously enough these two groups have many characters in common, namely 29 against 11. The differences are:—

1. Woolly nestlings, although both breed in holes.
2. Presence of downs in adult.
3. Dorsal pterylosis.
4. Large aftershaft (intermediate are, however, *Capito* and *Indicator*).
5. Aquinto-cubital.
6. No vomer.
7. Flexor tendons of toes.
8. Procoracoid process.
9. Cervical hæmapophyses.
10. Syrinx.
11. Intestinal convolutions.

Of these differences Nos. 1, 2, 6, 7, 8, 10, and 11 are of great importance.

Of the 29 positive characters or resemblances the form of the spina externa sterni alone is remarkable, otherwise nothing which cannot be explained equally well by the affinity of the Psittaci to the Coccyges or to the Coraciiformes, of which latter order, moreover, the Pici are an offshoot. The resemblances between the Pici and Psittaci have therefore chiefly to be looked upon as convergent analogies.

Final Conclusion.—The sifting of all these characters shows an undoubtedly close affinity between the Psittaci and Coraciidæ, but less intimate than with the Coccyges. The latter are, however, closely

related to the Coraciidæ, and are (as indicated by the *Opisthocomus*-Gallidæ connexion) the lowest of the three groups of Psittaci, Coraciidæ, and Coccyges. Cuculidæ, as well as Coraciidæ, are zoophagous, chiefly insectivorous. The Striges, as a lateral branch of the lower Coraciine stock, explain the considerable number of characters which connect the Striges with the Coccyges, 28 against 12, and with the Psittaci, 22 against 18. In our hypothetical tree the Psittaci would combine with the Coccyges into one bigger branch—Cuculiformes; the Psittacine twig to stand between that of the Musophagidæ and looking towards the branch of the Striges, which again come out of the bigger branch of the Coraciiformes. This big branch and that of the Cuculiformes would ultimately combine into a still bigger branch; below this bifurcation would come off *Opisthocomus* and lower still that of the Gallidæ. Thus the Psittaci permit us a glimpse at a large part of the Avine tree, namely at that big branch which downwards points towards the Galliformes and towards the Gallo-Ralline and Rallo-Limicoline region of the tree, while the same branch upwards ends not only in all the so-called Picariæ but also in the Pico-Passeres.

The laborious process exemplified in these comparisons was applied to all the families and was not without results, because certain families were gradually found to assume a central position towards which a number of others gravitated. Thus, for instance, the Coraciidæ had to be compared with not less than 10 other families; the Gallidæ with 8, &c. Notoriously difficult forms, as, for instance, Trogons and Colies, naturally caused more trouble than others, since the number of comparisons had to be increased.

The result of all this is the following classification. In the mode of denomination of the various smaller and larger combinations I have followed Fuerbringer's plan. I am sorry that my classification does not bear greater resemblance to his, but nobody who has really studied Fuerbringer's work will fail to perceive that I stand on my friend's shoulders, or rather on his two fundamental volumes in addition to my own work.

The *subfamilies*, which have been mentioned whenever desirable, end in *inæ*. The *families* end in *idæ*.

The Families are combined into Suborders, indicated by substantival names. The Suborders are combined into Orders, ending in *formes*, with a Latin substantive stem. The Orders could, if necessary, be combined into Phyla, ending in *morphæ*, with a Greek substantive stem; these would correspond with Fuerbringer's Orders, while my Orders are equivalent to his Suborders.

The whole of the Class Aves has been divided into 2 Subclasses, to which the names of Archornithes and Neornithes have been given, the equivalent names of Saururæ and Ornithuræ being objectionable, because there is no difference in the skeletal part of the tail of *Archæopteryx* and that of the Ratitæ, Crypturi, and Hesperornithidæ. The Neornithes are separated into the two Divisions of Ratitæ and

Cariuatæ. These names are likewise open to objection, but they have become household terms and they serve a practical purpose.

Many attempts have been made to *brigade* together two and two of my orders into combinations intermediate in value between Orders and Phyla—for instance, Tubinariformes and Ardeiformes, Charadriformes and Columbiformes—but ultimately these attempts have been abandoned as of little practical value. They are, however, conducive to the construction of the much searched for phylogenetic tree, but the very existence of such a single Avine tree is a problematic idea.

Under the heading of each group, be it subfamily, order, or subclass, is mentioned a variable number of characters. The sum total of these constitutes more than a diagnosis. The single characters themselves are not necessarily all those which have led to the establishment of the group in question, but the sum total of the characters mentioned has been thus arranged, first that it applies to all the members of the group, secondly that it does not occur again in those of any other group.

Class AVES.

Oviparous, warm-blooded, amniotic Vertebrates which have their anterior extremities transformed into wings. Metacarpus and fingers carrying feathers or quills. With an intertarsal joint. Not more than four toes, of which the first is the hallux.

I. Subclass ARCHORNITHES.

First, second, and third metacarpals and fingers separate. First finger with 2, second and third each with 3 phalanges. Each finger with a claw.

Upper jaw with conical teeth.

Skeleton of posterior extremities typically avine. Feet four-toed. Hallux posterior.

Vertebræ amphicœlous. Caudal vertebræ numerous, about 21, not terminating in a pygostyle.

About 24 rectrices, attached in pairs to about 12 caudal vertebræ.

Ribs without uncinate processes.

Wings with 6 or 7 well-developed primaries, attached to metacarpal III. and digits III. and II.; 10 cubital quills.

Extinct. Jurassic. Terrestrial—aerial.

1. ARCHÆOPTERYGIFORMES.

I. Archæopteryges. 1. *Archæopterygidæ.*

II. Subclass NEORNITHES.

Metacarpals fused with each other. Second finger the longest, third finger reduced. Caudal vertebræ apparently not more than 13 in number.

1st Division. NEORNITHES RATITÆ.

Nidifugous. Omnivorous. Terrestrial.

Rhamphotheca compound. Nares impervious. Holorhinal. Vertebræ heterocœlous.

Basipterygoid processes functional. Proximal articulating head of quadrate single.

Sternum without keel and without spina interna. Spina externa small or absent. Coracoid fused with scapula; both bones forming a very obtuse angle.

With incisura ischiadica; only in adult *Rhea* and *Dromœus* the distal end of the ischium fusing with the ilium and forming a foramen ischiadicum.

Wings reduced; flightless. Terminal caudal vertebræ not coalesced into a pygostyle.

Hypotarsus simple. Flexors of type II. or IV.

Adult without pterylæ. Oil-gland absent.

Cæca functional.

1. STRUTHIONES.

Ethiopian.

Maxillo-palatines articulating with the vomer, which touches neither palatines nor pterygoids.

Third and fourth toes only developed, terminal phalanges shortened, with stunted nails.

Procoracoid large. No clavicles. Tibia without bony bridge.

Aftershaft absent.

Cæca and rectum enormous. (*Unique.*)

2. RHEÆ.

Neotropical.

Maxillo-palatines large, fenestrated, not touching the vomer.

Palatines short, articulating with the vomer.

Hallux absent. Front toes with claws, middle phalanges shortened.

Procoracoid process large. No clavicles. Tibia without bony bridge.

Aftershaft absent.

Cæca large.

Syrinx tracheo-bronchial, with one pair of syringeal muscles. (*Unique among Ratitæ.*)

3. CASUARII.

Australasian.
Maxillo-palatines large, fused with vomer and premaxilla.
Vomer long, articulating with palatines and pterygoids.
Hallux absent. Front toes with claws, middle phalanges shortened.
Procoracoid process small. Clavicles rudimentary. Tibia without bony bridge.
Aftershaft very large. Cæca small, functional.

4. APTERYGES.

New Zealand.
Maxillo-palatines as in *Casuarii*, but vomer fused with palatines and pterygoids.
All the four toes well developed, with claws.
Procoracoid process rudimentary. No clavicles. Tibia with bony bridge over extensor tendons.
Aftershaft absent. Cæca large.

5. DINORNITHES.

New Zealand.
Palate as in *Casuarii*. Hallux variable.
Whole shoulder-girdle and wing fragmentary.
Procoracoid process rudimentary. Tibia with bony extensor bridge.
Aftershaft very large.

6. ÆPYORNITHES.

Madagascar.
Hallux present. Tibia without bony extensor bridge.

2nd Division. NEORNITHES CARINATÆ.

This division comprises all those Neornithes to which the sum of characters descriptive of the Ratitæ does not apply.

As a rule the Carinatæ are described as birds possessed of a carina sterni; an acrocoracoid process; separate scapulæ and coracoids, which form an acute or a right angle; complete furcula; ischiadic foramen; single-headed quadrate; a vomer which is not fused with the neighbouring bones of the palate.

The existence of such forms as *Crypturi*, *Didus*, *Ocydromus*, *Stringops*, *Hesperornis*, &c., does not permit the employment of these characters to differentiate the Carinatæ from the Ratitæ. These are reasons sufficient to contest the validity of these two divisions, which are, however, retained more for the sake of convenience than on the ground of demonstrable facts.

7. COLYMBIFORMES.

Cosmopolitan. Aquatic. Nidifugous. Zoophagous.
Schizognathous. No basipterygoid process. Nares pervious.

Rhamphotheca simple. Supraorbital glands present.
Neck without apteria. Aftershaft present. Oil-gland tufted.
No ectepicondylar process. Aquinto-cubital.
Legs short. Hallux small, front toes webbed or lobated.
High patellar+epicnemial process. (*Unique.*)
Intestinal convolutions orthocœlous, type II.
Cæca functional.

I. COLYMBI.

14 or 15 cervical vertebræ.
11 primaries.
Hypotarsus enclosing one triangular space.
Front toes webbed.

II. PODICIPEDES.

17 to 21 cervical vertebræ.
12 primaries.
Hypotarsus complex.
Front toes lobated.

8. SPHENISCIFORMES.

Antarctic. Marine. Nidicolous. Zoophagous.
Schizognathous. No basipterygoid processes.
Rhamphotheca compound. Nares impervious.
Large supraorbital glands. Oil-gland tufted.
Pterylosis without apteria. Aftershaft present.
Remiges and rectrices rudimentary, numerous.
Wings transformed into paddles. (*Unique.*)
Metatarsals short, incompletely fused. (*Unique.*)
Hypotarsus simple. Flexors of type II.
Coraco-humeral groove shallow.
No ectepicondylar process.
Procoracoid process rudimentary.
Cæca functional.

I. SPHENISCI.

9. PROCELLARIIFORMES.

Cosmopolitan. Marine. Nidicolous. Zoophagous.
Nestlings downy. Downs complex.
Oil-gland tufted. Aquinto-cubital.
Neck with lateral apteria.
Schizognathous.
Rhamphotheca compound. Large supraorbital glands.
Nares impervious, tubular.
Hallux small or rudimentary. Front toes webbed.
Hypotarsus complex, or with several grooves.
Coraco-humeral groove shallow. Ectepicondylar process large.

Tracheo-bronchial muscles attached to 7th or 5th bronchial rings.
Tongue mostly rudimentary.

I. Tubinares.

10. ARDEIFORMES.

Cosmopolitan. Aquatic.
Young passing through a downy stage.
Oil-gland tufted. Aquinto-cubital. Humero-coracoid deep. No ectepicondylar process.
Desmognathous. No basipterygoid process.

I. Steganopodes.

Cosmopolitan. Aquatic. Nidicolous. Piscivorous.
Rhamphotheca compound. Nares impervious.
No supraorbital glands. Angulare truncated.
Neck without apteria.
Legs short; all the four toes webbed together. (*Unique.*)
Hypotarsus complex. Flexors type of II.
Orthocœlous, type II. Tongue rudimentary.

1. *Phaetontidæ.*

15 cervical vertebræ.
Procoracoid process large.
Garrod's symbol AXY+.

2. *Phalacrocoracidæ.* (including Sulinæ, Plotinæ, Phalacrocoracinæ.)

18–20 cervical vertebræ.
Garrod's symbol AX+.

3. *Pelecanidæ.*

17 cervical vertebræ.
Procoracoid process small
Garrod's symbol A —.

4. *Fregatidæ.*

15 cervical vertebræ.
Procoracoid process small.
Garrod's symbol A+.

II. Herodii.

Cosmopolitan. Waders. Nidicolous. Zoophagous.
Bill long, pointed, laterally compressed, with simple rhamphotheca. Nares pervious.
No supraorbital glands.
Neck long, with long apteria. Downs of adults only upon the apteria. (*Unique* among Ardeiformes.)

Legs long; four toes, not webbed.
Hypotarsus complex. Flexors of type I. or VII.
Orthocœlous, type II. Cæca rudimentary.
Tracheo-bronchial muscles attached to second bronchial rings.

1. *Ardeidæ*.

19 or 20 cervical vertebræ.
Several pairs of powder-down patches.
11 primaries.—Cosmopolitan.

2. *Scopidæ*.

16 cervical vertebræ.
No powder-down patches.
10 primaries.—Ethiopian.

III. Pelargi.

Cosmopolitan. Waders.
Neck long, without apteria. Nares pervious.
Rhamphotheca simple.
Legs long. Hypotarsus simple.
Intestinal type IV., telogyrous.

1. *Ciconiidæ*.

Zoophagous. Nidicolous.
17 cervical vertebræ.
Hallux long, toes not webbed. Flexors of type I.
Tongue rudimentary.
Cæca rudimentary.
Syrinx without tracheo-bronchial muscles.

2. *Phœnicopteridæ*.

Tropical. Nidifugous.
18 or 19 cervical vertebræ.
Hallux small, front toes webbed. Flexors of type IV.
Tongue large and thick.
Cæca functional.
Syrinx with tracheo-bronchial muscles.

11. FALCONIFORMES.

Cosmopolitan. Nidicolous. Zoophagous.
Desmognathous.
Bill raptorial. Rhamphotheca simple, with ceroma.
Aquinto-cubital.
Feet raptorial. Hypotarsus simple.
Intestinal convolutions of type iV., telogyrous. Cæca rudimentary.
Coraco-humeral groove indistinct.

I. Cathartæ.

Neotropical.
Oil-gland nude. Neck without apteria.
Nares pervious.
Aftershaft absent.
Basipterygoid processes articulating with middle of pterygoids.
Procoracoid rudimentary.
Sternum with two pairs of notches.
Hypotarsus with two shallow grooves.
Flexors of type V.
Syrinx without muscles.

II. Accipitres.

Cosmopolitan.
Oil-gland tufted. Nares impervious.
Neck with lateral apteria.
Procoracoid process large.
Sternum with one pair of notches or fenestræ.
Flexors of type III.
Syrinx with tracheo-bronchial muscles.

1. *Vulturidæ.*

15 cervical vertebræ.
No basipterygoid processes.
Aftershaft present.
Coracoids present.

2. *Gypogeranidæ.*

15 cervical vertebræ.
Basipterygoid processes present.
Aftershaft present.
Coracoids separate.

3. *Pandionidæ.*

14 or 15 cervical vertebræ.
Basipterygoid processes absent.
Aftershaft absent.
Coracoids overlapping.

4. *Falconidæ.*

14 cervical vertebræ.
Basipterygoid processes absent.
Aftershaft present.
Coracoids separate.

12. ANSERIFORMES.

Cosmopolitan. Aquatic. Nidifugous.
Young downy.
Neck long, without apteria.

Aftershaft rudimentary.
Oil-gland tufted. Aquinto-cubital.
Rhamphotheca with ceroma; bill with lamellæ. Nares pervious.
Desmognathous. With basipterygoid processes.
Angulare of mandible long and recurved.
Coraco-humeral groove indistinct.
No ectepicondylar process.
Two pairs of pectoro-tracheal muscles. (*Unique.*)
Intestinal convolutions of type III.
Cæca functional.
Penis large, spiral. (*Unique* among Carinatæ.)

I. PALAMEDEÆ.

Neotropical.
Basipterygoid articulation on middle of pterygoids.
Hypotarsus simple.
Ribs without uncinate processes. (*Unique.*)

II. ANSERES.

Basipterygoid processes articulating with the palatine end of the pterygoids.
Hypotarsus complex.
Ribs with uncinate processes.

13. CRYPTURIFORMES.

Neotropical. Nidifugous. Phytophagous.
Schizognathous. Vomer fused with bones of palate. (*Unique.*)
Basipterygoid processes present.
Rhamphotheca compound. Nares impervious. Holorhinal.
Sternum with very slender and long mesosternum and simple posterior lateral processes. Procoracoid process rudimentary.
With incisura ischiadica.
Hypotarsus simple.
Flexors of type II.
Neck with lateral apteria.
Aftershaft rudimentary.
Oil-gland tufted. Quinto-cubital.
10 primaries.
Plagiocœlous, type V. Cæca large. Crop globular.

I. CRYPTURI.

14. GALLIFORMES.

Cosmopolitan. Phytophagous.
Schizognathous. Nares impervious. Rhamphotheca simple.

Furcula with hypocleidium.
Plagiocœlous, type V. Cæca large. Crop globular.
10 primaries.

I. Turnices.

14 or 15 cervical vertebræ.
Schizorhinal.
Sternum with long and simple posterior lateral processes.
Procoracoid process large.
No spina externa sterni.
Coracoids separate.
Hypotarsus complex. Hallux very small or absent.
Flexors of type IV.
Neck with lateral apteria.
Oil-gland tufted.
Quinto-cubital.

II. Galli.

16 or more cervical vertebræ.
Holorhinal.
Coracoids touching each other.
Flexors of type I. Hallux large.
Neck without lateral apteria.

1. *Gallidæ.*

16 cervical vertebræ. Nidifugous.
Spina communis sterni.
Sternum with long posterior lateral processes and with oblique processes.
Hypotarsus complex.

2. *Opisthocomidæ.*

18 or 19 cervical vertebræ. Nidicolous.
Spina externa only present.
Sternum with small notches or fenestra only; no oblique process.
Oil-gland tufted.

15. GRUIFORMES [1].

Cosmopolitan. Aquatic or paludic.
Angulare mandibulæ truncated. Rhamphotheca simple.

[1] Owing to the existence of such peculiarly specialized forms as *Eurypyga*, *Rhinochetus*, *Podica*, *Dicholophus*, and *Otis* (all of which are most intimately related to the bulk of the Grues and Ralli), it is not possible to admit some important characters into the diagnosis of the Gruiformes. They all are absolutely *nidifugous* with the exception of *Eurypyga* and *Heliornis* (the young of *Rhinochetus* are unknown). They are typically *schizognathous*, except *Rhinochetus* and *Dicholophus*. They have a *tufted oil-gland* except *Rhinochetus*, *Eurypyga*, *Dicholophus*, and *Otis*. They have lateral *cervical apteria* except *Eurypyga*, *Dicholophus*, and *Otis*. Their *feet* are those of Waders, except the tridactyle cursorial *Otis*. *Rhinochetus* alone has impervious *nares*.

No basipterygoid processes.
No ectepicondylar process.
Flexors of type I. or IV.
Peri-orthocœlous, type I.

I. Eurypygæ.

Neotropical.
With powder-down patches. (*Unique* among Gruiformes.)
Oil-gland nude. Schizorhinal.

1. *Eurypygidæ*.

Aquinto-cubital. No lateral cervical apteria.
Schizognathous. Nares pervious.
18 cervical vertebræ.
Sternum with one pair of notches.
Nidicolous.

2. *Rhinochetidæ*.

New Caledonia.
Quinto-cubital. Lateral cervical apteria.
Desmognathous. Nares impervious.
16 cervical vertebræ.
Sternum solid.
Hypotarsus with high ridges.

3. *Mesitidæ*.

Madagascar.
Cubital. Lateral cervical apteria.
Schizognathous. Nares pervious.
Sternum with long simple posterior lateral processes. Clavicles rudimentary.
17 cervical vertebræ.
Spina interna alone developed. (*Unique* among Gruiformes.)

II. Ralli.

Aquinto-cubital. With lateral cervical apteria.
Oil-gland tufted.
Schizognathous. Holorhinal.
14 or 15 cervical vertebræ.
Sternum with long simple posterior lateral processes.
Hypotarsus without canals but with high ridges.

III. Grues.

With lateral cervical apteria.
Oil-gland nude.
Schizognathous.
17 to 20 cervical vertebræ.
Sternum solid.
Hypotarsus complex.

IV. Dicholophi.

Neotropical.
No cervical apteria.
Oil-gland nude.
Schizognathous. Holorhinal.
14 or 15 cervical vertebræ.
Sternum with two posterior notches.
Hypotarsus simple.

V. Otides.

No cervical apteria. Downs of adults only on apteria. (*Unique* among Gruiformes.)
Schizognathous. Holorhinal.
Sternum with four posterior notches.
Hypotarsus complex. Hallux absent; feet *cursorial*.

16. CHARADRIIFORMES.

Cosmopolitan. Nidifugous.
Downs of adult on pterylæ and on apteria.
With lateral cervical apteria. Aftershaft present. 11 primaries.
Oil-gland tufted. Aquinto-cubital.
Schizognathous. Nares pervious.
Rhamphotheca simple.
15 cervical vertebræ (except *Œdicnemus* and *Parridæ*).
Coraco-humeral groove distinct.
Furcula with hypocleidium.
Peri-orthoccelous, with mesogyrous tendency; type I.
Flexors of type I. or IV.

I. Limicolæ.

Downs of young very simple, brush-like.
Hypotarsus with canals.
Front toes webbed.
Supraorbital glands variable.

1. *Chionididæ*.

Antarctic.
Schizorhinal. No basipterygoid processes.
Vomer broad. Rhamphotheca complex. (*Unique* among Charadriiformes.)

2. *Charadriidæ*.

Cosmopolitan.
Schizorhinal. With basipterygoid processes.

a. *Charadriinæ*.
b. *Scolopacinæ*.

3. *Glareolidæ.*

Afro-Indo-Australian.
Schizorhinal (except *Pluvianus*). No basipterygoid processes.
(*Glareola, Pluvianus, Cursorius, Dromas.*)

4. *Thinocoridæ* (incl. *Attagis*).

Neotropical.
Schizo- inclining to holorhinal.
No basipterygoid processes.
With a globular crop. (*Unique* among Charadriiformes.)
Phytophagous.

5. *Œdicnemidæ.*

Cosmopolitan.
Holorhinal. No basipterygoid processes.
16 cervical vertebræ.
No hallux.

6. *Parridæ.*

Tropical.
Schizorhinal. With basipterygoid processes.
Hallux long.
16 cervical vertebræ.

II. GAVIÆ.

Downs of young more complex, approaching typical downs.
Front toes webbed. Aquatic. Zoophagous.
Supraorbital glands always large. Schizorhinal.
Hypotarsus with two grooves.

1. *Alcidæ.*

Sternum with two notches. Coracoids separate.
No ectepicondylar process. Procoracoid process small.
Periarctic.

2. *Laridæ.*

Sternum with four notches. Coracoids touching each other. With ectepicondylar process.
Procoracoid process large.
Cosmopolitan.

17. COLUMBIFORMES.

Cosmopolitan. Phytophagous.
Adult downs scarce and restricted to the apteria.
No lateral cervical apteria. 11 remiges.
Aftershaft rudimentary or absent.
Oil-gland nude or absent. Aquinto-cubital.

Schizognathous. Schizorhinal. Nares impervious.
Rhamphotheca simple.
Hypotarsus with one canal. Procoracoid process large.
Flexors of type I. or IV. Crop globular.

I. Pterocles.

African and Asiatic. Nidifugous.
Flexors of type IV. Hallux rudimentary.
Syringeal muscles broncho-tracheal.
Sterno-tracheal muscles separate.
Cæca large.
15 or 16 cervical vertebræ.

II. Columbæ.

Cosmopolitan. Nidicolous.
No downs in adults.
Flexors of type I. Hallux functional.
Syringeal muscles tracheal only.
Both sterno-tracheal muscles united asymmetrically.
Cæca not functional.
14 or 15 cervical vertebræ.

1. *Dididæ.*

Wings and furcula reduced.
Flightless.

2. *Columbidæ.*

Wings and furcula fully developed.

18. CUCULIFORMES.

Cosmopolitan. Nidicolous.
Neck with lateral apteria. 10 primaries.
Desmognathous. No basipterygoid processes.
Holorhinal. Nares impervious. Rhamphotheca simple.
Sternum with small notches or fenestræ.
Procoracoid process large.
13, 14, or 15 cervical vertebræ.
Humerus with ectepicondylar process.
Feet zygodactylous, scansorial.
Flexors of type I. Hypotarsus complex.
Intestinal convolutions of type IV. or V., with telogyrous tendencies.

I. Coccyges.

Nestlings naked.
Downs of adults restricted to the apteria.
Quinto-cubital.
Procoracoid approaching, or fusing with, acrocoracoid, forming a foramen.
Syrinx bronchial.
Intestinal convolutions of type V.

1. *Cuculidæ*.

Insectivorous. Cæca large.
Oil-gland nude.
Vomer present.
Coracoids separate.
14 cervical vertebræ.

2. *Musophagidæ*.

Ethiopian.
Frugivorous. Cæca absent.
Oil-gland tufted.
Vomer absent.
Coracoids overlapping.
15 cervical vertebræ.

II. PSITTACI.

Tropical. Nestlings downy. Phytophagous.
Downs of adults very complex, on apteria and pterylæ.
Aquinto-cubital. Bill globular, hooked.
Rhamphotheca with basal, soft ceroma surrounding the nostrils.
13 or 14 cervical vertebræ.
Syrinx with 3 pairs of muscles, and of *unique* structure.
Intestinal convolutions of type IV.; telogyrous.
Cæca absent.

1. *Psittacidæ*.

19. CORACIIFORMES.

Cosmopolitan. Nidicolous.
Feet four-toed, not zygodactylous, not webbed.
Metatarsus short. Flexors of type I., V., VII., or VIII.
Holorhinal. Nares impervious.
Sternum solid, or with small notches or fenestræ.
13, 14, or 15 cervical vertebræ.
Intestinal convolutions of type VI. or VII.

I. STRIGES.

Cosmopolitan. Zoophagous. Nestlings downy.
Downs of adults restricted to apteria. Plumage soft.
Feet raptorial, fourth toe reversible.
Flexors of type I. Hypotarsus simple.
Tibia without bony bridge for extensor tendons.
No spina interna. 14 cervical vertebræ.
Bill raptorial, without ceroma.
Schizognathous, with desmognathous tendency.
Basipterygoid processes complete.
Intestinal convolutions of type VI.
Cæca functional.

1. *Strigidæ*.

II. Macrochires.

Cosmopolitan.
10 remiges, terminal quill long.
Oil-gland nude.
Spina externa and interna very small or absent.
Coracoids separate.
13 or 14 cervical vertebræ.
Intestinal convolutions of type VI.

1. *Caprimulgidæ.*

Cosmopolitan.
Nestlings downy. Adult downs restricted to the apteria.
Bill broad, wide, short.
13 or 14 cervical vertebræ.
Hypotarsus complex.
Flexors of type V.
Syrinx bronchial.
Cæca functional.

2. *Cypselidæ.*

Cosmopolitan.
Nestlings naked. Adult downs restricted to the apteria. Insectivorous.
Bill broad, wide, short.
13 or 14 cervical vertebræ.
Hypotarsus simple.
Flexors of type V.
Syrinx tracheo-bronchial.
Cæca absent.

3. *Trochilidæ.*

American.
Nestlings naked. No downs in adults.
Bill long, slender. Tongue bi-tubular.
14 cervical vertebræ.
Hypotarsus simple.
Flexors of type I.
Syrinx tracheo-bronchial.
Cæca absent. Crop present (*unique* among Macrochires).

III. Colii.

Ethiopian. Phytophagous.
10 remiges. Oil-gland tufted. No downs in adults.
Desmognathous. No basipterygoid processes.
Spina externa well developed.
13 cervical vertebræ.
Left carotid only.
Hypotarsus complex. Flexors of type V.
Intestinal convolutions of type VI. Cæca absent.

1. *Coliidæ.*

IV. Trogones.

Tropical. Frugivorous.
10 primaries. Oil-gland nude. No downs in adults.
Schizognathous. Basipterygoid processes rudimentary.
15 cervical vertebræ.
Spina externa long, forked. Coracoids touching each other.
Hypotarsus complex.
Flexors of type VIII. (*Unique.*)
Intestinal convolutions of type VI.
Cæca functional.

1. *Trogonidæ.*

V. Coraciæ.

Cosmopolitan.
Desmognathous. Basipterygoid processes absent, or (*Coraciidæ*) sometimes rudimentary.
14 or 15 cervical vertebræ.
Hypotarsus complex.
Syrinx tracheo-bronchial.

1. *Coraciidæ.*

Palæogæan. Zoophagous.
Dorsal pterylosis with apterium.
10 primaries. Oil-gland nude.
No downs in adults.
14 cervical vertebræ.
No spina interna.
Procoracoid process large, but not fusing with the acrocoracoid.
Right and left carotids present.
Cæca functional.

2. *Momotidæ.*

Neotropical.
Without dorsal apterium.
10 primaries.
No downs in adults.
Spina interna absent.
Coracoids separate.
Procoracoid process very small.
15 cervical vertebræ.
Right and left carotids present.

3. *Alcedinidæ.*

Zoophagous. Cosmopolitan.
Without dorsal apterium.
11 primaries. Oil-gland tufted.

Downs present in adults, on pterylæ and on apteria. (*Unique* among Coraciæ.)
15 cervical vertebræ.
Spina interna absent.
Procoracoid process as in *Upupidæ*.
Cæca not functional. Tongue rudimentary.

4. *Meropidæ*.

Palæogæan. Insectivorous.
With dorsal apterium.
Oil-gland nude. No downs in adults.
15 cervical vertebræ.
Left carotid only.
Spina communis.
Procoracoids as in *Upupidæ*.
Cæca functional.

5. *Upupidæ*.

Palæogæan.
Oil-gland tufted. No aftershaft.
Spina communis.
Procoracoid process fused with acrocoracoid, forming a foramen.
14 or 15 cervical vertebræ.
Intestinal convolutions of type VII.
No cæca. Tongue rudimentary.

a. *Upupinæ*. Insectivorous.

With lateral cervical apteria.
10 primaries.
14 cervical vertebræ.
Flexors of type VII.

b. *Bucerotinæ*. Insectivorous and frugivorous.

Without lateral apteria.
11 primaries.
14 or 15 cervical vertebræ.
Flexors of type V.

c. *Irrisorinæ*. (Anatomy unknown to me.)

20. PASSERIFORMES.

Cosmopolitan. Nidicolous.
Neck with lateral apteria. Quinto-cubital.
No basipterygoid processes. Holorhinal.
14 or 15 cervical vertebræ.
Spina externa long; spina interna absent.
Sternum with small notches or foramina.
Second and third toes always turned forwards.
Flexors of type I., VI., or VII.
Hypotarsus complex.
Intestinal convolutions of type VII. or VIII.
Cæca not functional.

I. Pici.

Zygodactylous, or hallux absent.
Nestling and adult downs absent. Nesting in holes.
14 cervical vertebræ.
Flexors of type VI. (*Unique.*)
Intestinal convolutions of type VII. (*Galbula* and *Bucco* unknown.)
Cæca absent, except in *Galbulidæ*.

1. *Galbulidæ* (Galbulinæ + Bucconinæ).

Desmognathous.
Spina externa forked. Right and left carotids.
Oil-gland nude in *Galbulinæ* and in most *Bucconinæ*.

2. *Picidæ* (Picinæ, Yunginæ).

Schizo-ægithognathous.
Spina externa forked.
Oil-gland tufted. Left carotid only.

3. *Capitonidæ* (Capitoninæ + Indicatorinæ).

Ægitho-desmognathous.
Spina externa unpaired.
Oil-gland tufted. Left carotid only.

4. *Rhamphastidæ*.

Frugivorous.
Desmognathous.
Spina externa unpaired.
Oil-gland tufted. Left carotid only

II. Passeres.

Ægithognathous.
Hallux present; 2nd, 3rd, and 4th toes always turned forwards.
Nestlings with downs of complex structure.
Oil-gland nude. Left carotid only.
Cæca not functional.
Intestinal convolutions of type VII. or VIII.

1. *Eurylæmidæ*.

Indian. Austro-Malayan.
Hallux weak; front toes syndactyle.
15 cervical vertebræ.
Spina externa long, single.
Intestinal convolutions of type VIII.
Flexors of type I.
Oligo-mesomyodous.

2. *Menuridæ.*

Australian.
Hallux the strongest toe. Front toes eleutherodactyle.
Flexors of type VII.
14 cervical vertebræ.
Spina externa forked.
Intestinal convolutions of type VII.
Di-acro-myodous.

a. *Menurinæ.* Furcula complete.
Three pairs of syringeal muscles.

b. *Atrichiinæ.* Clavicles rudimentary.
Two pairs of syringeal muscles.

3. *Passeridæ.*

Front toes eleutherodactyle.
Hallux the strongest toe.
14 cervical vertebræ,
Spina externa forked.
Flexors of type VII.
Intestinal convolutions of type VIII.

a. *P. oligomyodæ.* American.
Mostly mesomyodous, never di-acro-myodous.

b. *P. tracheophonæ.* Neotropical.
Syrinx tracheal.

c. *P. polymyodæ.* Cosmopolitan.
Di-acro-myodous.

APPENDIX.

List of the Characters employed in determination of the Affinities of the various Groups of Birds.

A. *Development.*

Condition of young when hatched: whether nidifugous or nidicolous; whether naked or downy, or whether passing through a downy stage.

B. *Integument.*

Structure and distribution of the first downs, and where distributed.

Structure and distribution of the downs in the adult: whether absent, or present on pterylæ or on apteria or on both.

Lateral cervical pterylosis: whether solid or with apteria.

Dorso-spinal pterylosis: whether solid or with apterium, and whether forked or not.

Ventral pterylosis: extent of the median apterium.

Aftershaft: whether present, rudimentary, or absent.

Number of primary remiges.

Cubital or secondary remiges: whether quinto- or aquinto-cubital.

Oil-gland: present or absent, nude or tufted.

Rhamphotheca: whether simple or compound, *i. e.* consisting of more than two pieces on the upper bill.

C. *Skeleton.*

Palate: Schizo-desmognathous. Nares, whether pervious or impervious, *i. e.* with or without a complete solid naso-ethmoidal septum.

Basipterygoid processes: whether present, rudimentary, or absent; and their position.

Temporal fossa, whether deep or shallow.

Mandible: os angulare, whether truncated or produced: long and straight or recurved.

Number of cervical vertebræ.

Hæmapophyses of cervical and of thoracic vertebræ: occurrence and shape.

Spina externa and spina interna sterni: occurrence, size, and shape.

Posterior margin of the sternum, shape of.

Position of the basal ends of the coracoids: whether separate, touching, or overlapping.

Procoracoid process: its size and the mode of its combination with acrocoracoid.

Furcula: shape; presence or absence of hypocleidium and of interclavicular process.

Groove on the humerus for the humero-coracoidal ligament: its occurrence and depth.

Humerus, with or without ectepicondylar process.

Tibia: with bony or only with ligamentous bridge, near its distal tibio-tarsal end, for the long extensor tendons of the toes: occurrence and position of an intercondylar tubercle, in vicinity of the bridge.

Hypotarsus: formation with reference to the tendons of the long toe-muscles:—(1) simple, if having only one broad groove; (2) complex, if grooved and perforated; (3) deeply grooved and to what extent, although not perforated.

Toes: number and position, and connexions.

D. *Muscles.*

Garrod's symbols of thigh-muscles A B X Y,—used, however, in the negative sense.

Formation of the tendons of the m. flexor perforans digitorum: the number of modifications of which is 8 (I.–VIII.) according to the numbering in *Bronn's Vögel*, p. 195, and *Fuerbringer*, p. 1587.

E. *Syrinx.*

Tracheal, broncho-tracheal, or bronchial.

Number and mode of insertion of syringeal muscles.

F. *Carotids.*

If both right and left present, typical: or whether only left present, and the range of the modifications.

G. *Digestive Organs.*

Convolutions of the intestinal canal. Eight types, numbered I.–VIII., according to *Bronn's Vögel*, p. 708, and P. Z. S. 1889, pp. 303–316.

Cæca: whether functional or not.

Tongue: its shape.

Food.—Two principal divisions, *i. e.* Phytophagous or Zoophagous, with occasional subdivisions such as Herbivorous, Frugivorous, Piscivorous, Insectivorous, etc.

List of Characters employed occasionally.

Shape of bill.

Pattern of colour. Number of rectrices; and mode of overlapping of wing-coverts, according to *Goodchild* (P.Z.S. 1886, pp. 184–203).

Vomer. Pneumatic foramen of humerus.

Supraorbital glands.

Crop.

Penis.

Certain wing-muscles according to *Fuerbringer*.

Mode of life: Aquatic, Terrestrial, Aerial, Diurnal, Nocturnal, Rapacious, etc.

Mode of nesting: breeding in holes.

Structure of eggs.

Geographical distribution.

April 5, 1892.

W. T. Blanford, Esq., F.R.S., F.Z.S., in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of March 1892:—

The total number of registered additions to the Society's Menagerie during the month of March was 107, of which 57 were by presentation, 17 by birth, 23 by purchase, 4 by exchange, and 6 were received on deposit. The total number of departures during the same period, by death and removals, was 96.

Among the deaths, I regret to have to announce that of the last of the Society's stock of Giraffes—a male, purchased Jan. 27th, 1879. We are now, therefore, for the first time since the arrival of the four original Giraffes on the 24th of May, 1836, without any representative of this Mammal in our series. Nor does there seem to be at present much chance of our being able to supply the deficiency. Owing to the closure of the Soudan by the Mahdists, the supplies of this and other large African Mammals, which were formerly obtained *viâ* Cassala and Suakim, have ceased, and, so far as I can make out, with the exception of a single old female (for which an exorbitant price is demanded), there are now no living Giraffes in the market.

From the table which I now exhibit, it will be seen that there have been 30 individuals of the Giraffe in the Society's Gardens since 1836, of which 17 have been born there, and 13 have been acquired by purchase. Of these 30, one was presented to the Royal Zoological Society of Ireland in 1844, five have been sold at prices varying from £450 to £150, and the remainder have died in the Gardens.

List of Giraffes that have lived in the Society's Gardens.

No.	Sex.	How obtained.	How disposed of.
1.	♀	Imported, May 24, 1836.	Died, Oct. 15, 1852.
2.	♂	Do. do.	,, ,, 29, 1846.
3.	♂	Do. do.	,, Jan. 14, 1849.
4.	♂	Do. do.	,, Jan. 6, 1837.
5.	♂	Born in the Menagerie, June 19, 1839.	,, June 28, 1839.
6.	♂	Born in the Menagerie, May 24, 1841.	Presented to the Dublin Zoological Society, June 14, 1844.
7.	♂	Do. do. Feb. 25, 1844.	Died, Dec. 30, 1853.
8.	♂	Do. do. April 22, 1846.	,, Jan. 22, 1867.
9.	♂	Do. do. Feb. 12, 1849.	Sold, April 27, 1850.
10.	♀	Imported, June 29, 1849.	Died, Nov. 3, 1856.
11.	♀	Do. do.	Sold, Oct. 29, 1853.
12.	♂	Born in the Menagerie, March 30, 1852.	,, March 29, 1853.
13.	♀	Do. do. April 25, 1853.	Died, May 21, 1872.
14.	♀	Do. do. May 7, 1855.	,, Nov. 6, 1866.
15.	♀	Do. do. July 16, 1859.	,, Dec. 2, 1859.
16.	♀	Do. do. May 26, 1861.	Sold, May 1, 1863.
17.	♂	Do. do. Oct. 7, 1861.	Died, Dec. 18, 1861.
18.	♂	Do. do. May 8, 1863.	,, Nov. 18, 1863.
19.	♂	Do. do. Sept. 24, 1863.	,, April 21, 1864.
20.	♂	Do. do. March 31, 1865.	,, April 3, 1865.
21.	♀	Do. do. April 20, 1865.	Sold, May 31, 1866.
22.	♂	Do. do. Sept. 14, 1866.	Died, Nov. 6, 1866.
23.	♂	Do. do. March 17, 1867.	,, June 20, 1881.
24.	♀	Purchased, July 23, 1867.	,, Sept. 12, 1869.
25.	♂	Do. Jan. 5, 1871.	,, April 27, 1874.
26.	♀	Do. Oct. 11, 1871.	,, May 21, 1878.
27.	♂	Do. July 25, 1874.	,, Jan. 8, 1879.
28.	♀	Do. do.	,, July 9, 1886.
29.	♀	Do. do.	,, Nov. 24, 1891.
30.	♂	Do. Jan. 27, 1879.	,, March 22, 1892.

Mr. Sclater called attention to two mounted heads of Swayne's Antelope[1] (*Bubalis swaynei*), which had been kindly lent to him by Messrs. Rowland Ward & Co. These were the specimens obtained by Mr. T. W. H. Clarke and Colonel Paget, and other members of the same party, which were alluded to in the 'Field' of March 26, 1892 (vol. lxxvi. p. 432), and one of which was there figured.

Mr. Sclater remarked that the heads now exhibited were evidently those of a male and female, the male in this, as in other species of the genus *Bubalis*, differing in the stouter and thicker horns.

Mr. Sclater stated that Prof. Giglioli, of Florence, had kindly sent him a coloured drawing of the head of an Antelope obtained by Count August Boutourline and Dr. Traversi in Shoa in 1882, which had been referred by Dr. Giglioli (Ann. Mus. Civ. Genova,

[1] See above, p. 98.

ser. 2, vi. p. 19) to the Hartebeest of South Africa (*Bubalis caama*), but that it was evident, from the shape of the horns and colour of the hairs, that this specimen also belonged to *B. swaynei*.

In reference to some remarks that had been made upon his usage of "*Bubalis*" instead of "*Alcelaphus*" for this group of Antelopes, Mr. Sclater pointed out that "*Bubalis*" of Lichtenstein was proposed in 1814 (Mag. d. Gesellsch. nat. Fr. vi. p. 152), two years before "*Alcelaphus*" of Blainville, and had been constantly used by Sundevall, Peters, and other writers, so that it had undoubtedly good claims to priority.

A note was read from Professor Jeffrey Bell regarding the habitat of *Bipalium kewense*. This interesting Planarian, first found in Kew Gardens, had been observed in very various parts of the world. In only one case, however, did the circumstances of its discovery make it possible that the worm was indigenous to the place where it was met with. That one place was Samoa, where Mr. J. J. Lister found it under stones in the bush. Mr. Fletcher, in communicating this fact to the Linnean Society of New South Wales (see Zool. Anzeig. 1891, p. 139), had expressed the opinion that there was little ground for supposing that the species was indigenous in Samoa. Further reason, however, for supposing that Samoa may be one of the places in which the worm is indigenous was to be found in the fact that Mr. R. B. Leefe had recently collected the same worm in Tongatabu. Prof. Bell had learnt from the Director of the Royal Gardens, Kew, that though no plants had, to the Director's knowledge, been received directly from Tongatabu, exchanges had been made with Fiji. It might be urged that the probability of the group of islands just named being the original home of the species was, on the whole, increased by the facts now stated.

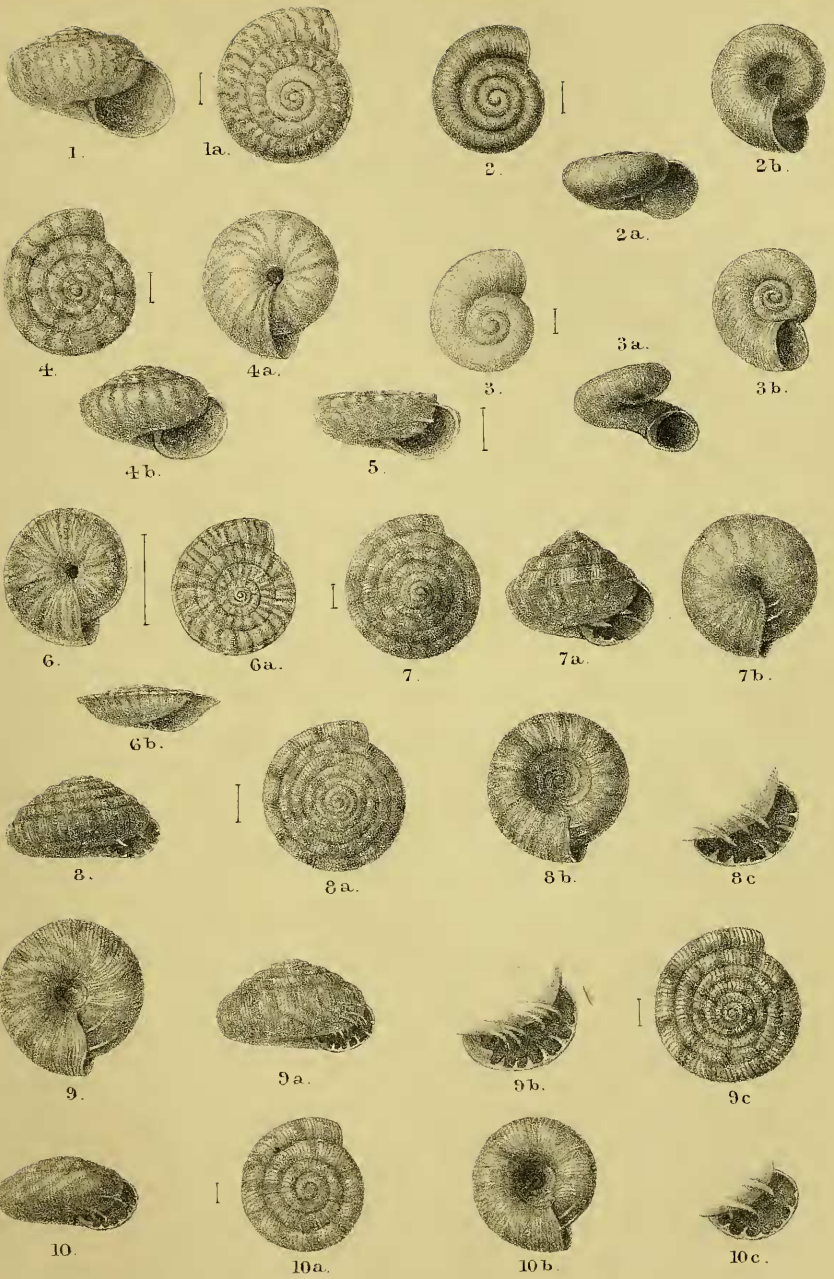
The following papers were read :—

1. On the Land-Shells of St. Helena. By Edgar A. Smith.

(Plates XXI. & XXII.)

[Received March 2, 1892.]

Last year I had the honour of presenting to the Society an account of the marine Mollusca of St. Helena. I now propose to introduce to its notice some remarks upon the terrestrial fauna of that island. Like the former, the present report is based chiefly upon collections made by Capt. W. H. Turton, R.E., and presented to the British Museum. The collection is the most complete that has ever been made, and contains examples not only of most of the known species, but also of as many as eleven undescribed forms, a proportion of more than one third of the entire fauna. Our best thanks are due to Capt. Turton for the labour of getting together such an interesting



R. Mintern lith.

Mintern Bros. imp.

LAND SHELLS OF ST HELENA.


13.


13a.


11.


16.


21.


15.


12.


20.

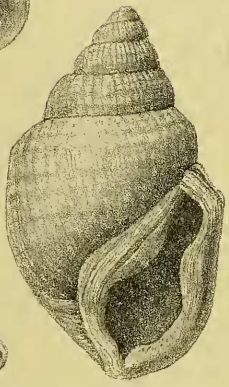

20a.


14.


17.


17a.

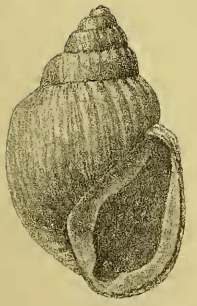

18.

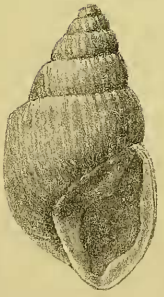

11a.


19.


19a.


19b.


11b


11c


11d.


11e.

R. Mintern. lith.

Mintern Bros. imp

LAND SHELLS OF St HELENA.

collection, and for the careful notes regarding localities which accompany the specimens.

The most complete account of the terrestrial fauna[1] of St. Helena hitherto published is that given by Mr. Wollaston in his work 'Testacea Atlantica,' published in 1878. He there enumerates 29 species of Land-Shells, of which 9 at least must be regarded as introductions since the discovery of the island 390 years ago. Some of these species—for example, *Limax gagates*, *Vitrea cellaria*, *V. alliaria*, *Helix pulchella*, *H. aspersa*, and *Pupa umbilicata* (=*helenensis*, Pfr.)—were doubtless introduced along with European shrubs and plants. *Patula pusilla* probably was imported from Madeira, the Canary Islands, or the Azores, where it is very abundant; and the two remaining species, *Stenogyra compressilabris* and *Acicula veru*, upon which some remarks will be made at the end of this paper, are evidently West-Indian forms. With regard to the twenty indigenous species mentioned by Mr. Wollaston, some, in my opinion, are merely varieties and not specifically distinct. After a careful study of all the forms, including the eleven new species now described, the total number of indigenous species may be estimated at twenty-seven. Of these, seven are living on the island at the present time, eighteen have become extinct since the destruction of the primæval forests, and two are found both recent and semi-fossil.

A great deal has been written upon the relationship of the fauna of St. Helena with regard to other parts of the globe, and an interesting *résumé* of this subject is given by Mr. Wallace in his work 'Island Life,' pp. 281–297.

Professor Forbes many years ago, from a study of the Mollusca, hazarded the theory of a possible ancient connection of St. Helena with South America. This view, however, was vigorously rejected by Wollaston, Jeffreys, and others, and, considering the present isolated position of the island, the actual enormous depth of the surrounding ocean, and other cogent reasons[2], this theory certainly does appear unsupportable. There is, however, a greater resemblance between the shell-fauna of the two localities than was recognized either by Forbes or Wollaston; and the occurrence of a species, discovered since they investigated this subject, and more resembling a group (*Tomigerus*) which is exclusively Brazilian in distribution than any other, together with the reasons which influenced Forbes, would seem to indicate that country as the probable source whence some of the indigenous but now extinct species, or their ancestors, originated. How they were transmitted is a hopeless problem to solve, and although drift-wood, carried by oceanic currents, is doubtless answerable for a good deal in the way of distribution, the subject must apparently ever remain one of mere speculation. It has been stated by Mr. Wollaston that the large *Bulimus auris-vulpina* is represented in the Solomon Islands and New Zealand by

[1] No freshwater forms have as yet been discovered.

[2] Neither the flora of St. Helena nor the insect-fauna suggests particularly a South-American relationship or origin.

species which have much the same type of form; but this supposed resemblance, in reality, proves to be less, on a careful comparison of the two types, than one at first would imagine. Perhaps the most striking similarity to Pacific forms occurs among the *Patulæ*. Such species as *P. radiella*, Pfr., *P. multilamellata*, Garret, *P. acuticostata*, Mousson, and others from the Polynesian Archipelago are exact representatives of the *Endodontæ*, or toothed group of *Patulæ*, from St. Helena. Still, although these Pacific forms are certainly of the same type, we must also remember that the same form of *Patula* occurs in the island of Fernando Noronha, namely, *P. quinquelirata*, Smith, and possibly also on the adjacent mainland of Brazil itself, although its presence there has yet to be discovered.

In the following complete list of the *indigenous* species references are not given, as they are obtainable by consulting Mr. Wollaston's work. In conclusion I propose to discuss one or two of the introduced species.

A. *Indigenous Species.*

1. Vitrea mellissii (Wollaston).

This minute species, which is known to me only by description, is possibly an introduction.

Patula (without teeth).

2. Patula spurca (Sowerby). (Plate XXI. figs. 1, 1 *a*.)

This species was unknown to Mr. Wollaston, and consequently being misled by the somewhat poor figure given by Forbes, he has placed it in the genus *Hyalina* (=*Vitrea*). The examination, however, of a number of specimens, some received from Mr. Alexander, who furnished Forbes with his examples, others from Capt. Turton, proves that it should be located in the group *Patula*. Sowerby's description being so brief, I think it advisable to recharacterize it, thus:—

Testa anguste umbilicata, suborbicularis, tenuis, albida, rufo-variegata, haud nitida; spira parum elevata, ad apicem obtusa; anfractus 5, *convexiusculi, regulariter et lente accrescentes, lineis incrementi tenuibus confertis flexuosis obliquis striati, ultimus ad peripheriam rotundatus, antice haud descendens; apertura late lunata, simplex, haud dentata vel lirata; peristoma tenue, margine columellari leviter expanso et reflexo.*

Diam. maj. 5 *millim., min.* $4\frac{1}{2}$, *alt.* $3\frac{2}{3}$; *apertura* $2\frac{1}{4}$ *longa*, $1\frac{2}{3}$ *lata*.

Hab. Sugarloaf Hill and Quarry (*Turton*). Extinct (? living).

In some specimens the spire is more elevated than in others, and occasionally the apex is scarcely raised above the last whorl. The majority of the examples examined have to a great extent lost their original colour and are now of a uniform whitish tint; but a few from Sugarloaf Ridge, which have the appearance of live shells, look of a pale reddish colour to the naked eye, but when viewed under a

lens it is seen that they are variegated with irregular radiating blotches of red and white intermingled. The lines of growth are distinct, finely hair-like, arcuate and oblique on the upper surface, and gently undulating on the body-whorl. The umbilicus is deep but narrow, equalling about one fifth the diameter of the base.

3. Patula dianæ (Pfeiffer). (Plate XXI. figs. 2–2 *b*.)

This species does not belong to the group *Hyalina* (= *Vitrea*), as supposed by Wollaston, but falls naturally into *Patula* together with the preceding species, which it very closely resembles.

Hab. Diana's Peak. Living (*Pfr.*).

4. Patula persoluta, sp. nov. (Plate XXI. figs. 3–3 *b*.)

Testa minuta, late et aperte umbilicata, discoidalis, planorbiformis, pallide rufescens (?); anfractus $3\frac{1}{2}$, *perconvexi, sutura profundissime discreti, subceleriter accrescentes, lineis incrementi obliquis striati, ultimus tubiformis, rotundatus, antice solutus et descendens; apertura subcircularis, margine columellari leviter planato.*

Diam. maj. $3\frac{1}{2}$ *millim., min.* $2\frac{3}{4}$, *alt.* 2.

Hab. Side Path (*Turton*). Extinct.

This is a very remarkable little species, at once recognizable by its Planorbiform appearance, and the detached anterior portion of the body-whorl. The upper whorls do not rise above the last, and the suture is remarkably deep. The umbilicus is very wide and open, permitting the convolution of the whorls to be observed to the apex. Both of the specimens examined exhibited traces of red towards the apex, and there is every probability of the living shell having exhibited more or less of that tint.

5. Patula lætissima, sp. nov. (Plate XXI. figs. 4–4 *b*.)

Testa minuta, anguste umbilicata, depresse subconoidea, alba, maculis radiantibus rufis supra et infra picta; anfractus $5\frac{1}{2}$, *lente accrescentes, superne convexiusculi, sutura subprofunda sejuncti, lineis incrementi fortibus striati, ultimus ad peripheriam rotundatus, antice haud descendens; apertura semilunata, edentula; peristoma tenue, simplex, margine columellari dilatato; umbilicus profundus, angustus, diam. totius* $\frac{1}{5}$ *adæquans.*

Diam. maj. 4 *millim., min.* $3\frac{1}{2}$, *alt.* $2\frac{1}{3}$.

Hab. Sugarloaf Ridge, near the top (*Turton*). Extinct.

This little species is remarkable for its small deep umbilicus, the toothless aperture, rather well-marked lines of growth, the rounded periphery to the body-whorl, and the red colour-markings. These consist of radiating blotches on the upper surface of the whorls, which become rather angular and wavy on the middle and lower part of the body-whorl.

PATULA (with teeth, *Endodonta*).

6. PATULA BIPLICATA (Sowerby).

Hab. North of the island. Extinct.

A small species with two palatal folds. Unknown to me.

7. PATULA BILAMELLATA (Sowerby). (Plate XXI. fig. 5.)

Var. UNILAMELLATA. Aperture with the lower parietal lamella wanting.

Hab. Sugarloaf Ridge, rare (*Turton*). Extinct.

This name was also applied by Pfeiffer to a small species of "*Helix*" in 1845, or one year after the publication of Sowerby's description. As it cannot be regarded as generically distinct, although very different in form, I propose to substitute the name *Patula pagodiformis*.

8. PATULA VERNONI, sp. nov. (Plate XXI. figs. 6–6 *b*.)

Testa anguste perforata, depresse discoidea, superne planata, ad peripheriam acute carinata, alba, superne et infra rufo radiata; anfractus 6, *lente accrescentes, vix convexiusculi, lineis incrementi tenuibus striati, ultimus acute carinatus, supra et infra carinam leviter compressus, antice haud descendens, lineis radiantibus rufis undulatis infra pictus, radiatim tenuiter striatus; apertura parva, subrhomboidalis, lira parietali tenui intrante munita; peristoma simplex, tenue, umbilicum versus leviter incrassatum.*

Diam. maj. 12 *millim., min.* 11, *alt.* 4.

Hab. Side Path (*Turton*). Extinct.

This species is at once recognized by its very flat spire, the compressed very acute keel, the minute umbilicus, the single fine liration upon the upper part of the body-whorl, running within the aperture, and the style of colouring. The red rays upon both the upper and lower surfaces are more or less wavy and interrupted. There is no other sculpture excepting the fine lines of growth which cross the upper surface of the whorls obliquely and are a little flexuous beneath. The body-whorl has a more distinct impression below the keel than above it. I have much pleasure in naming this very distinct species after my late friend T. Vernon Wollaston, whose work 'Testacea Atlantica' is one of the most accurate and complete hitherto published upon any Molluscan fauna.

9. PATULA PSEUSTES, sp. nov.[1] (Plate XXI. figs. 7–7 *b*.)

Testa conoidea, pyramidalis, anguste umbilicata, albida, superne maculis quadratis, inferne flammulis rufis picta; anfractus $6\frac{1}{2}$, *convexi, sutura profunda discreti, radiatim tenuiter costulati, ultimus ad peripheriam rotundatus, inferne striis tenuissimis flexuosis sculptus; apertura lunata, obliqua, intus denticulis inæqualibus sex (duobus lamelliformibus parietalibus prominentibus, tribus minimis supra columellam, una*

[1] ψεύστης, a deceiver.

tenui prominenti in medio palati) instructa; peristoma tenue, marginibus remotis, columellari leviter dilatato.

Longit. $2\frac{2}{3}$ *millim., diam.* $3\frac{1}{3}$; *apertura* $1\frac{1}{3}$ *longa,* $\frac{1}{2}$ *lata.*

Hab. Flagstaff Hill (*E. W. Alexander*). Extinct.

This species has the spire more elevated and conical than the other species of *Patula* from the island. *P. cutteri*, Pfr., may approach it somewhat, but that species is said to have only two parietal lamellæ, and two basal denticles near the columella. The present species has an additional basal denticle, and a prominent thin palatal lamella, which falls as it were between the two on the inner or parietal side of the aperture.

10. Patula cutteri (Pfeiffer).

Hab. Diana's Peak. Living (*Pfr.*).

A small species, unknown to me, apparently similar in general features to the preceding, but with only four teeth within the aperture, two parietal and two basal near the columella, more narrowly umbilcated and probably more strongly sculptured.

11. Patula polyodon (Sowerby). (Plate XXI. figs. 8–8 *c*.)

This is the most widely umbilicated of all the species of *Patula* from St. Helena, and this feature alone is sufficient to distinguish it from the rest. The whorls also, in adult shells eight to nine in number, enlarge very slowly. The striæ are fine, regular, arcuately oblique above, and slightly wavy on the last whorl. There are *three parietal liræ* extending far within the aperture, of which the upper and lower are nearly always double. The plicæ within the outer lip are almost invariably (in adult shells) seven in number, subequidistant, but not of equal thickness, two or three towards the columella being stouter than the rest, which are slender and extend some distance within.

Diam. maj. $5\frac{1}{4}$ mill., min. 5, alt. $2\frac{1}{2}$.

Hab. Side Path, Sugarloaf Quarry, Sugarloaf Ridge (*Turton*). Extinct.

The species to which the foregoing remarks apply is certainly the *Helix alexandri* of Forbes, for in the British Museum there are specimens of it presented by Mr. Alexander, who also furnished Forbes with the shells he described. Moreover the description is fairly applicable, especially that portion of it referring to the umbilicus, which is described as "*maximus*." It is much less certain that this is the *H. polyodon* of Sowerby, but as Mr. Wollaston has united these species as well as *H. helenensis* (Forbes), Pfeiffer, it will probably be advisable to acquiesce in this decision. There are, however, certain differences in the descriptions, which seem to indicate that more than one species was described by these authors, for instance:—*H. polyodon* is said to consist of six striated whorls, with three parietal and five palatal liræ, and a moderate-sized umbilicus, whereas *H. alexandri* is described as having seven strongly striated whorls, three parietal and eight palatal liræ, and a very large umbilicus. *H. helenensis* is characterized as possessing eight very

narrow closely costate whorls, and only two parietal liræ and the same number within the outer lip. Pfeiffer states that *H. helenensis* was described by Forbes in the Proc. Zool. Soc. for 1851, and this statement is copied both by Reeve and Wollaston. This appears to be an error, for after a careful search I have been unable to discover in any publication the description by Forbes of any species of *Helix* under that name.

12. Patula minutissima, sp. nov. (Plate XXI. figs. 9–9 *c*.)

Testa conoidea-depressa, mediocriter late umbilicata, albo et rufo maculata et variegata; spira leviter elevata, superne obtusa; anfractus 7, *primi duo læves, pallide rufescentes, cæteri convexiusculi, lirulis tenuibus arcuatis obliquis, in anfr. ult. flexuosis, ornati, ultimus ad peripheriam acute rotundatus, vel interdum obsolete subangulatus, antice haud descendens; apertura oblique semilunata; lamellæ parietales tenuissimæ, in cochleis adultis sex, in exemplis juvenilioribus quatuor vel quinque; plicæ palatales* 8–10; *peristoma tenue, marqine columellari expanso.*

Diam. maj. $4\frac{3}{4}$ *millim., min.* $4\frac{1}{2}$, *alt.* $2\frac{1}{4}$.

Hab. Sugarloaf Ridge (*Turton*). Extinct.

This species is smaller than *P. polyodon*, more narrowly umbilicated, has fewer whorls, coarser and more remote striæ, and a different armature within the aperture. In full-grown shells there are as many as six parietal liræ, as it were, in two groups of three. They are very fine and extend a long way within. The plicæ within the outer lip vary apparently from seven or eight to ten or eleven, and some of them are more prominent than others. The red markings take the form of radiating blotches on the upper surface, and more undulating or zigzag streaks beneath.

13. Patula leptalea, sp. nov.[1] (Plate XXI. figs. 10–10 *c*.)

Testa orbicularis, depressa, late umbilicata, albida rufo variegata; spira vix elevata; anfractus 5, *primi* $1\frac{1}{2}$ *læves, cæteri convexiusculi, tenuissime arcuatim striati, lente accrescentes, ultimus ad peripheriam acute rotundatus, antice haud descendens; apertura oblique semi-lunata; lamellæ parietales tres* (*quarum suprema et mediana duplices sunt*) *tenues, longe intrantes; plicæ palatales circa sex.*

Diam. maj. $3\frac{1}{4}$ *millim., min.* 3, *alt.* $1\frac{1}{3}$.

Hab. Sugarloaf Quarry (*Turton*). Extinct.

This species is much smaller than *P. polyodon* and not quite so large as *P. minutissima*; it is flatter than either, much more finely striated than the latter, and has a different oral armature from both. The parietal liræ are unequal in size, that nearest the collumella being the smallest. The two others are about equal and double, and between occasionally a very small and slender intermediate lira is observable.

[1] λεπταλέος, delicate.

Bulimus (Pachyotus).

14. Bulimus auris-vulpina (Chemnitz). (Plate XXII. figs. 11–11*d*.)

Hab. All along Sugarloaf Ridge (*Turton*). Extinct.

With regard to this, the largest extinct snail of St. Helena, Mr. Wollaston admits the resemblance "*to a certain extent*" to certain Brazilian species, at the same time observing "that much the same type of form exists equally in the Solomon Islands and New Zealand." Whilst agreeing with those remarks, I would point out that although in the Pacific shells referred to the apertures are somewhat similar, the general form, especially of the body-whorl, is much more elongate. On the contrary, *B. melanostoma* and *B. bilabiatus* from Brazil, cited by Forbes in comparison, exhibit not only like proportions, but also similar oral characters.

Captain Turton in his notes remarks: "The shape appears to me to vary immensely, and therefore I have sent as many as 30 specimens, so as to show all the intermediate forms. The very slender ones are, I suppose, *B. darwinianus*, but I can scarcely draw any line between them. I noticed that the different varieties of this shell generally (always, I think) came from different parts of the ridge; and you will observe that the more recent shells which retain their colour do not grow to the same size as the more fossilized ones."

I fully concur in the opinion arrived at by Captain Turton respecting *B. darwinianus* (Plate XXII. fig. 11 *d*) being merely an elongate form of the *B. auris-vulpina*.

His other observation, with regard to the smaller size of the more recent specimens, is also very interesting. This diminution might be accounted for by the vegetation being less luxuriant and other conditions being less favourable to finer growth than in former times, before the partial destruction of the primæval forests which then clothed the island.

The freshest examples are of a light reddish colour and generally of a somewhat darker tint towards the apex. The top of the plications at the suture are whitish, and there is more or less of this colour variously distributed over the surface in the form of irregular streaks and blotches. A few subfossil snails' eggs obtained at Sugarloaf Ridge along with this species evidently from their size belong to it. They are roundly ovate, being 6½ millim. in length and 6 broad. Some other much smaller eggs were also found by Captain Turton at the same place, but in this instance it would be mere guesswork to suggest to which species they belong.

(Bulimulus.)

15. Bulimulus blofeldi, Forbes. (Plate XXII. fig. 12.)

Hab. Side Path; very common (*Turton*).

This species is very like the following in form, but has not the same strong spiral sculpture. However in the best preserved example indications of transverse striæ and some oblique faint reddish markings are observable.

16. Bulimulus helena, Quoy and Gaimard. (Plate XXII. figs. 13, 13 *a*.)

With this species I unite *B. fossilis*, of Sowerby, and *B. sealeianus* of Forbes (Pl. XXII. fig. 13 *a*). Typical specimens are of the same general form as the S.-American *B. proteus*, Broderip, and have somewhat similar granular sculpture.

Hab. Sugarloaf Ridge and Quarry, and the Barn (*Turton*). Extinct (? living).

(Section —— ?)

17. Bulimulus subtruncatus, sp. nov. (Plate XXII. fig. 14.)

Testa subfossilis, elongato-ovata, superne acuminata, imperforata, lineis incrementi obliquis tenuibus striata; anfractus 7, *convexiusculi, sutura subprofunda sejuncti, ultimus oblique declivis, sed prope labrum leviter ascendens, apertura inverse auriformis, longit. totius* ½ *haud æquans; labrum tenue, antice leviter patulum vel expansum; columella obliqua, rectiuscula, callo tenui superne labro juncto induta, antice plus minus subtruncata.*

Longit. 31½ *millim., diam.* 12½; *apertura* 14 *longa,* 7 *lata.*

Hab. Side Path, common (*Turton*). Extinct.

Although not particularly like *B. virgulatus*, Fér., it is perhaps more allied to that species than any other. The subtruncation of the columella, however, is more pronounced.

(Peronæus ?)

18. Bulimulus subplicatus (Sowerby). (Plate XXII. fig. 15.)

Hab. Sugarloaf Ridge, common (*Turton*). Extinct.

Quite distinct from any other known species and of elongate form like the section *Peronæus*. The *Cochlicopa terebellum* of Sowerby, a slightly more slender form, is evidently merely a slight variety in which the plications at the suture, probably through the worn condition of the specimens, appear to be less developed.

(Section —— ?)

19. Bulimulus exulatus (Benson). (Plate XXII. fig. 16.)

Hab. Sugarloaf Ridge, common (*Turton*). Extinct.

Remarkable for the distinct truncation of the collumella like *Leptachatina*.

(Section —— ?)

20. Bulimulus turtoni, sp. nov. (Plate XXII. figs. 17, 17 *a*.)

Testa anguste perforata, ovato-conica, tenuissima, nitida, fusco-cornea, strigis irregularibus opaco-lacteis, longitudinaliter picta; anfractus 7, *convexiusculi, lineis incrementi obliquis striati, ultimus ad peripheriam rotundatus, in exemplis juvenilibus obsolete angulatus; apex subpapillaris; apertura ovata, superne acuminata, longit. totius* ½ *haud æquans;*